

## PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

## Brake Fluids

We, **FARBWERKE HOECHST AKTIENGESELLSCHAFT** vormals **Meister Lucius & Bruning**, a Company recognised by German law of 6230 Frankfurt (M)-Hoechst, Germany and **ALFRED TEVES MASCHINEN UND ARMATURENFABRIK, KOMMANDIT-GESELLSCHAFT**, a Company recognised by German Law of Frankfurt/Main, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Brake fluids generally contain glycols, polyglycols and ethers thereof. As glycols are used, for example, ethylene glycol, propylene glycol and butylene glycol. High demands are made on such brake fluids. They must have a high boiling point, good resistance to heat and cold, good lubricating power and good reserve alkalinity and must simultaneously be as non-corrosive as possible. The last mentioned requirement has become particularly important as the periods of operation and use of brake appliances have recently been considerably prolonged. Moreover, new materials and combinations of material as well as the strong efforts exerted by heat and shearing constantly give rise to further corrosion problems.

To ensure a high reserve alkalinity almost all brake fluids used today contain borates to produce buffering. However, alkali metal borates and alkali metal boric acid glycol esters form hydrolysis products with infiltrated water, which have a corroding action on light metal.

The present invention provides brake fluids comprising a mixture of (a) an alkylene glycol and/or a polyalkylene glycol and/or an ether thereof and (b) a corrosion inhibitor which is a primary aliphatic straight or branched-chain amine containing 8 to 18 carbon atoms, and/or an alkylene oxide condensate thereof, and/or a salt of such an amine or condensate with an aliphatic carboxylic acid.

The components (b) of these brake fluids give an excellent protection against corrosion

and also a buffering effect that approximately equals that of sodium borate. The aliphatic carboxylic acid may be for example a mono- or dicarboxylic acid, especially a fatty acid.

Primary aliphatic amines as above defined which are derived from natural fatty acids, or synthetic fatty amines with more or less branched chains may be used. Examples of such amines are octylamine, nonylamine, decylamine, dodecylamine, oleylamine, cetylamine, iso-nonylamine, iso-decylamine. Suitable alkylene oxide condensates of the aforesaid amines are, for example, their polyethylene glycol ether derivatives with up to 20 moles, advantageously 1—8 moles, of ethylene oxide.

The following Examples illustrate the invention.

In the Examples, a parent mixture was prepared from

40.6% of the monoethylether of polyethyleneglycol

20% of the monobutylether of polyethyleneglycol

35.4% of diethyleneglycol/triethyleneglycol

4.0% of a polymer of an alkylene oxide as lubricant.

The mixture of diethyleneglycol and triethyleneglycol in the above mixture may be wholly or partially replaced by dipropylene glycol, dibutylene glycol, tripropyleneglycol or tributylene glycol.

To this parent mixture different corrosion inhibitors in accordance with the invention were added in amounts of 0.1—3% as follows:

## EXAMPLE 1.

0.2% of isononylamine

1.0% of octylamine . 2 mols of ethylene oxide ( $C_2H_4O$ )

## EXAMPLE 2.

1.0% of octylamine . 2 mols of  $C_2H_4O$

0.2% of octylamine . 8 mols of  $C_2H_4O$

## EXAMPLE 3.

- 0.3% of decylamine  
 1.0% of coconut-oil fat amine . 2 mols of  $C_2H_4O$   
 5 1.5% of an ester of tri-isopropanol amine and boric acid

## EXAMPLE 4.

- 1.0% of coconut-oil fat amine . 2 mols of  $C_2H_4O$   
 10 1.5% of an ester of tri-isopropanol amine and boric acid

## EXAMPLE 5.

- 1.0% of octylamine . 2 mols of  $C_2H_4O$   
 15 1.5% of an ester of tri-isopropanol amine and boric acid

## EXAMPLE 6.

- 1.5% of octylamine . 2 mols of  $C_2H_4O$   
 0.1% of tallow fatty amine oleate

## EXAMPLE 7.

- 20 0.1% of octylamine octoate  
 0.1% of coconut-oil fatty amine oleate  
 0.2% of octylamine . 8 mols of  $C_2H_4O$   
 1.0% of oleylamine . 2 mols of  $C_2H_4O$

## EXAMPLE 8.

- 25 1.0% of octylamine . 2 mols of propylene oxide  
 0.2% of octylamine . 2 mols of butylene oxide

## EXAMPLE 9.

- 30 Instead of the parent mixture used in Examples 1—8, a parent mixture was used

in which 20% of the mixture of 35.4% of diethyleneglycol and triethyleneglycol had been replaced by dipropylene glycol. The following corrosion inhibitors were added:

- 1.0% of coconut-oil fat amine . 2 mols of propylene oxide  
 0.5% of coconut-oil fat amine . 2 mols of propylene oxide neutralised with oleic acid.

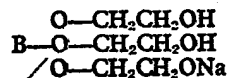
## EXAMPLE 10.

The parent mixture was varied in a manner such that, instead of 35.4% of diethyleneglycol/triethyleneglycol, a derivative of butylene glycol, i.e. ethoxy 1,2-butylene glycol was used. The corrosion inhibitors were the same as in Example 6.

Further suitable corrosion inhibitors are oleylamine . 1 mol of  $C_2H_4O$ , isononylamine . 2 mols of  $C_2H_4O$ , isodecylamine . 2 mols of  $C_2H_4O$ , octylamine octoate, tallow fatty amine oleate.

The following Table shows the buffering of the parent mixture containing no additives, of a mixture containing a common inhibitor based on alkali metal boric acid glycol ester and of mixtures containing the brake fluids of the preceding Examples. For the comparison example carried out with a common inhibitor there was used

parent mixture + 8.5% of alkali metal boric acid glycol ester



TABLE

	Parent mixture	Comparison with common inhibitor	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Ex. 8	Ex. 9	Ex. 10	Ex. 11
Corrosion test according to SAE 70 R 3 (1) Attack on copper mg/cm <sup>2</sup>	-0.429	-0.194	-0.048	-0.051	-0.012	0	0	-0.030	-0.019	-0.040	-0.021	-0.021	
EMPA test (2) + 5% of H <sub>2</sub> O Attack on													
cast iron	0	0	0	0	0	0	0	0	0	0	0	0	
tin	-0.027	-0.017	0	0	-0.020	0	-0.011	0	-0.018	-0.006	-0.014	0	
avional (3)	-0.285	-0.137	-0.014	0	-0.028	0	-0.019	0	0	0	0	0	
copper	-0.096	-0.239	-0.050	-0.032	-0.024	-0.064	-0.062	-0.024	-0.076	-0.041	-0.053	-0.020	
pH 1:9 (4) HCl (5)	6.7 2.6	8.9 8.2	9.9 8.0	9.4 7.4	9.0 7.1	8.9 6.6	9.4 7.4	9.1 7.2	8.6 6.5	9.0 7.5	8.7 6.5	9.0 7.4	

(1) SAE 70 R 3: internationally used specification for hydraulic brake fluids edited by "Society of Automotive Engineering" in the U.S.A. For 70 R 3 severe test conditions are used. Edited June 1960. (Corresponding to British Standard SMMT 200/1).

(2) EMPA test: a method of examining corrosion by brake fluids worked out by "Eidgenössisches Material-Prüfamt" of Switzerland. The metals cast iron, tin, avional and copper are exposed in a glass container with air cooler in 80 cc of test liquid for 14 days to a temperature of 75° C. By differential weighing, the loss in weight of the metals is determined in mg/cm<sup>2</sup>.

(3) Avional: an aluminium forging alloy of the following composition 94.0% of Al, 4.3% of Cu, 1.0% of Mn, 0.7% of Mg

(4) pH values 1:9=1 part by volume of brake fluid, 9 parts by volume of distilled water

(5) pH values HCl: mixture like 1:9 + 0.4 part by volume of 0.1 N HCl

**WHAT WE CLAIM IS:—**

1. Brake fluids comprising a mixture of (a) an alkylene glycol and/or a polyalkylene glycol and/or an ether thereof and (b) a corrosion inhibitor which is a primary aliphatic straight or branched-chain amine containing 8 to 18 carbon atoms, and/or an alkylene oxide condensate thereof, and/or a salt of such an amine or condensate with an aliphatic carboxylic acid.
- 5 2. A brake fluid as claimed in Claim 1 which contains 0.1 to 3.0% by weight of the corrosion inhibitor.
- 10 3. A brake fluid as claimed in Claim 1 or 2 wherein a polymer of an alkylene oxide is added as a lubricant.
- 15 4. A brake fluid as claimed in Claim 1 and substantially as described herein with reference to any one of the Examples.

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